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Full Length Research Article

# Influence of Intra row spacing on growth and fodder yield of Lablab (*Lablab purpureus* [L]) in Semi – Arid Sokoto Nigeria

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**ABSTRACT:** A Field experiment was conducted in 2010 and repeated in 2011 cropping seasons at the Usmanu Danfodiyo University Teaching and Research Farm, Dabagi to determine the effect of intra row spacing on growth and yield of *Lablab purpureus.* Treatments consisted three intra row spacings (20, 30 and 40cm) laid out in a Randomized Complete Block Design (RCBD) replicated three times. The results of the trial showed that intra row spacing significantly ($P < 0.05$) affected stand establishment count with 20cm producing the highest (43.3)number of stands and plant height at week 3 after sowing in 2011 cropping season. Tallest plants (42.2 cm) were produced by 20cm intra row spacing. Leaf number was significant ($P< 0.05$) at 9 weeks after sowing in 2010 cropping season. Thirty (30) cm intra row spacing produced the highest no. of leaves (25). Leaf length was not significantly affected ($P > 0.05$) by intra row spacing. The longest leaf (9.9 cm) was produced by 30 cm intra row spacing. Leaf width was also not significantly affected ($P > 0.05$) by intra row spacing with 30 cm intra row spacing producing the widest leaf (8.9 cm). Dry matter yield was not affected ($P > 0.05$) by intra row spacing however, 30 cm intra row spacing produced the highest dry matter yield of 1707.7 kg/ha. It was concluded from this research that 30 cm intra row spacing produced the highest dry matter yield of *Lablab purpureus* (L) and is recommended for semi arid Sokoto environment.
**Keywords:** Row spacing, Fodder yield, *Lablab purpureus*

## INTRODUCTION

Most African countries are presently in the midst of food crises (Omokanye, 2001). One of the ways of increasing livestock production in Nigeria is to increase the area and quality of legume based pastures. Forage legumes in particular are used as green manure, cover crops and short term pastures in rotation with cereal crops (Omokanye, 2001). In the Sudano – Sahelian region availability of nutritious feed (fodder) due to low and erratic rainfall and the long dry season extending from October to May (Sivakumar, 1990). In the arid (North East) and semi – arid regions of this country, annual grasses that are the main source of nutrition for the ruminant populations grow within the three months rainy season; thus decline in quantity and quality in less than half of the year. For most part of the year, the animals rely on crop residue and browse supplementation. According to Odunze *et al.* (2004), ruminant performance in Northern Guinea Savanna of Nigeria is affected by seasonal variation in the availability and quality pasture. Improved live – weight gains have been reported on legumes (Thomas and Lascano, 1999). Supplementation of feeds with forage legumes encourages more roughage intake and digestion in sheep (Adu *et al.,* 1992). In Nigeria, traditional livestock rearing has been the specialized vocation of nomadic and transhumant pastoralists, therefore technological changes in livestock and feed production management strategies have been targeted at this group (Mohamed-Salim, 1992).

Good agronomic practices such as spacing, time of sowing and fertilizer application have been associated to high biological and economic yield potentials (Onwueme, 1990). Thus, it is important to determine the appropriate agronomic factors that optimize forage yield. Sheaffer *et al*. (2001). The objective of this study was to investigate the influence of different intra row spacing on growth and fodder yield of Lablab.

## MATERIALS AND METHODS

Field experiment were conducted during 2010 and 2011 cropping seasons at Usmanu Danfodiyo University, Sokoto Teaching and Research Farm, Dabagi, Sokoto ($13^0$ 01'N; $5^0$ 15' E, 350 m a. s. l.). Sokoto lies in the Sudan Savanna agro ecological zone of Nigeria with erratic and scanty rainfall (Singh, 1995) that lasts for about 4 months (mid June to September) and long dry period (October to May). The annual rainfall is highly variable with an annual average of 700mm. The

temperature is also variable throughout the year with an average of 28.3$^0$C. Relative humidity is generally low for the greater part of the year and is about 20 – 35% in January and increases to 60 – 80% in August (Rao, 1983). The treatments consisted of three intra – row spacings (20cm, 30cm and 40cm) laid out in a Randomized Complete Block Design (RCBD) and replicated three times. The land was ploughed and ridged at 80cm inter row spacing using hoe prior to planting. Sixty (60) kg $P_2O_5$ ha$^{-1}$ was applied using SSP (18% $P_2O_5$). The fertilizer was broadcasted and incorporated immediately into the soil in accordance with the method used by Nworgu and Ajayi (2005). A variety of *Lablab Rongai* was obtained from the National Animal Production Research Institute (NAPRI) forage seed store at Shika, Zaria, Nigeria. Prior to planting seeds were soaked in warm water for 5 minutes to soften the seed coat and facilitate germination. Three seeds were dibbled (Nworgu and Ajayi, 2005) on the ridges to avoid water – logging (Murphy and Colucci, 1999). Manual weeding was adopted and carried out at three and six weeks after sowing. Data on growth parameters (leaf length, leaf width, plant height, plant cover and leaf number) were recorded at 3, 6, 9 and 12 weeks after sowing (WAS). Five randomly selected plants were tagged for measurement of growth parameters in the subsequent weeks of investigation.

Plant establishment count was done at 4 weeks after sowing by counting the stands in each plot (Amodu, *et al*. 2004). Leaf length was measured from the five randomly selected plants, from the base of the leaf stalk to the tip of the leaf using meter rule at 3, 6, 9 and 12 weeks after sowing. Leaf width was measured at the widest potion of the leaves from the five randomly selected plants with a measuring ruler at 3, 6, 9 and 12 weeks after sowing. Plant height was measured from the base of the plant to the tip of the tallest leaf with a meter rule from the five randomly selected plants at 3, 6, 9 and 12 weeks after sowing. Leaf number was taken from the five randomly selected plants in each plot at 3, 6, 9 and 12 weeks after sowing by counting the number leaves on the randomly selected plant. Five randomly selected plants were used to record plant cover by taking the dimension of the spread from the centre (radius) at 3, 6, 9 and 12 weeks after sowing. The herbage yield was determined by cutting the plant at the height of 5cm above ground level for the yield determination at 12 week after sowing using a weighing spring balance. Samples were later air dried to determine the dry matter yield in kg/ha. Data obtained was subjected to analysis of variance (ANOVA) using the Statistical Analysis Software (SAS, 2003). Mean separation was carried out where significant differences were observed using Duncan's New Multiple Range Test (DNMRT).

## RESULTS AND DISCUSSION

### Stand establishment count

The mean stand establishment count as influenced by intra row spacing Lablab is presented in Table 1. The Table showed that intra row spacing influenced ($P< 0.05$) stand establishment count in 2010, 2011 and in the combined analysis. Intra row spacing of 20 cm recorded the highest count of 43 stands. Widest intra row spacing (40cm) recorded the least counts of 20 stands. Malami and Sama'ila (2012) reported the highest stand count at closer intra row spacing and fewer stand count at wider intra row spacing of cowpea grown in the same environment.

### Leaf Length (cm)

The mean leaf length as influenced by intra row spacing is presented in Figure 1. The results showed that leaf length in respective of the treatments increased linearly from week 3 to week 12 after sowing.

It also revealed that in the 2010 and 2011 cropping seasons and in the combined analysis there was no significant effect of intra row spacing ($P> 0.05$).The leaf length in 2010 cropping season was higher than those recorded in 2011 cropping season.This could be as a result of the higher rainfall experienced in 2010 compared to the year 2011 (Table 4). The longest leaf recorded was 9.9 cm for 30 cm intra row spacing which was slightly higher than the value (9.86cm) reported by Malami and Abdullahi (2007) for the same crop in the same environment.

### Leaf Width (cm)

The mean leaf width as influenced by intra row spacing and weeding regime is presented in Figure 2. The results though not statistically significant increased linearly from week 3 to 12 in all the years and combined. The results of this study showed that 2010 cropping season recorded wider leaves width compared to 2011. This could be

possibly as a result of more rainfall recorded in the year 2010. Thirty centimetres (30 cm) recorded the widest leaf (8.9 cm). This was slightly higher than 7.72cm reported by Malami and Abdullahi (2007) reported for the same crop in the same environment.

**Plant Height (cm)**

The mean plant height as influenced by intra row spacing is presented in Table 2. The result showed that plant height increased with increase from week 3 to week 12. This result showed that Intra row spacing had no significant effect (P > 0.05) on the plant height of Lablab in both 2010 and 2011 cropping seasons and combined except in week 3 of 2011 cropping season. Twenty centimetre intra row spacing produced the tallest plant, with a height of 42.2cm. This was not in agreement with the report of Ihsanullah *et al.* (2002) who observed in *Vigna radiata* L. that wider spacings produced taller plants. Our values were however in agreement with those reported by Sevgi *et al*. (2007) that at closer spacing, taller Soya bean plants are produces.

**Plant cover (cm)**

The mean plant cover as influenced by intra row spacing and weeding regime is presented in Table 3. The table showed that plant cover increased from week 3 to week 12 of data collection. It also revealed that in both the 2010 and 2011 cropping seasons and the years combined there was no significant (P> 0.05) effect for both intra row spacing. However, 30 cm intra row spacing produced the widest plant cover of 45.3 cm. This result was however in contrast with the report of Malami and Sama'ila (2012) for *Vigna unguiculata,* a legume grown in the same environment where intra row spacing significantly influenced plant cover.

**Leaf Number**

The mean leaf number as influenced by intra row spacing is presented in Figure 3.It revealed that leaf number increased from week 3 to week 12. In the 2010 and 2011 cropping seasons and combined. Intra row spacing showed no significant effect (P > 0.05) on the leaf number, except for week 9 of the 2010 cropping season. Thirty centimetre intra row spacing recorded more number of leaves (23.3) as compared to 20 (15.7) and 40(13) cm intra row spacing. This could be compared to the report of Arora*et al.* (1971) for cowpea at 30 cm spacing. Srinivas and Lingam (1988) and Thimmegowda (1990) reported thatthe number of leaves increased with increased spacing which isin contrast with our report. Malami and Samaila (2012), reported that leaf number was not affected by intra row spacing in *Vignaunguiculata* a legume grown in the same environment.

**Dry Matter Yield (kg/ha)**

The result of this study revealed that intra row spacing did not show significant (P > 0.05) effect on dry matter yield of lablab in both 2010 and 2011 cropping seasons and the combined Table. However it revealed that 30cm intra row spacing produced 1707.7 kg/ha.

**Table 1:** Stand establishment count of Lablab as affected by intra row spacing

| Treatment<br>Intra row Spacing (cm) | 2010 | 2011 | Combined |
|---|---|---|---|
| 20 | 43.3[a] | 39.6[a] | 41.4[a] |
| 30 | 28.7[b] | 28.0[b] | 28.3[b] |
| 40 | 20.6[c] | 20.3[c] | 20.5[c] |
| SE± | 0.58 | 0.83 | 0.52 |
| Significance | s | s | s |

**Means in a column followed by same letters are not significantly different using DMRT at 5% level. ns = not significant, s = significant**

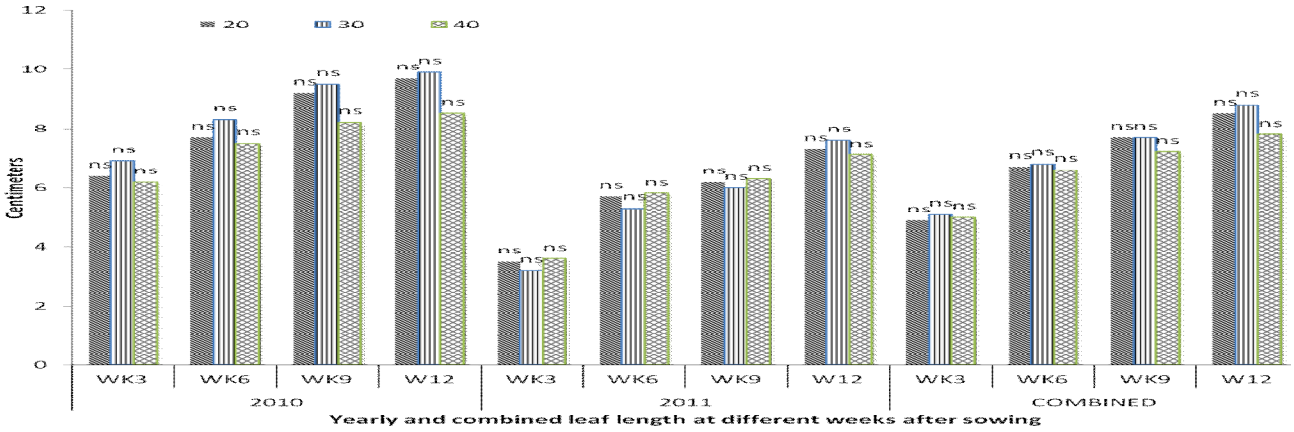


**Figure 1: Mean leaf length (cm) of *Lablab purpureus* (L.) as influenced by intra row spacing during 2010 and 2011 cropping season and the two years combined**

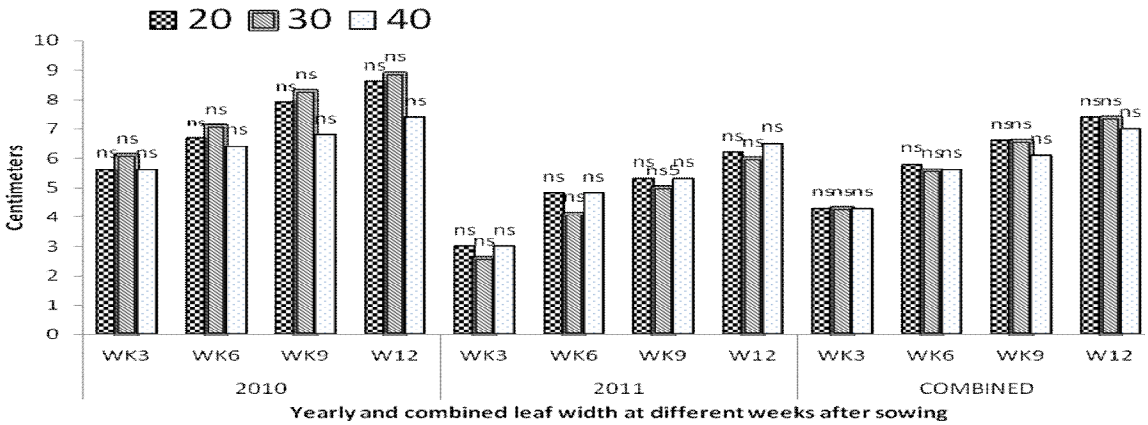


**Figure 2: Mean Leaf Width (cm) of *Lablab purpureus* (L)as influenced by intra row spacing during 2010 and 2011 cropping season and the two years combined**

**Table 2:** Plant height (cm) of Lablab as affected by intra row spacing and weeding regime

| Treatment | 2010 | | | | 2011 | | | | Combined | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Spacing (cm)** | **Wk3** | **Wk6** | **Wk9** | **Wk12** | **Wk3** | **Wk6** | **Wk9** | **Wk12** | **Wk3** | **Wk6** | **Wk9** | **Wk12** |
| 20 | 12.9 | 25.7 | 37.5 | 42.2 | 9.8[b] | 11.0 | 17.3 | 20.1 | 11.4 | 18.3 | 27.4 | 31.1 |
| 30 | 14.7 | 29.3 | 39.9 | 39.9 | 8.5[b] | 10.8 | 16.6 | 18.9 | 11.6 | 20.0 | 28.3 | 29.4 |
| 40 | 11.2 | 26.8 | 33.1 | 38.5 | 10.0[a] | 12.3 | 19.9 | 24.5 | 10.6 | 19.6 | 26.5 | 30.5 |
| **SE ±** | 1.40 | 1.99 | 1.95 | 2.68 | 0.36 | 0.66 | 2.08 | 2.10 | 0.69 | 1.09 | 1.72 | 2.11 |
| **Significance** | ns | ns | ns | ns | s | ns | ns | ns | ns | ns | ns | ns |

Means in a column followed by same letters are not significantly different using DMRT at 5% level. ns = not significant, s = significant, wk = week

| Treatment | 2010 | | | | 2011 | | | | Combined | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Spacing (cm)** | **Wk3** | **Wk6** | **Wk9** | **Wk12** | **Wk3** | **Wk6** | **Wk9** | **Wk12** | **Wk3** | **Wk6** | **Wk9** | **Wk12** |
| **20** | 17.3 | 21.4 | 30.3 | 37.9 | 7.1 | 12.8 | 14.0 | 17.1 | 12.2 | 17.1 | 22.1 | 27.5 |
| **30** | 16.8 | 21.4 | 36.1 | 45.3 | 7.1 | 12.3 | 15.1 | 18.5 | 12.0 | 16.9 | 25.6 | 31.9 |
| **40** | 15.9 | 19.7 | 24.4 | 32.3 | 7.6 | 14.1 | 15.6 | 19.8 | 11.8 | 16.9 | 20.0 | 26.1 |
| **SE±** | 0.62 | 1.31 | 3.99 | 4.59 | 0.47 | 1.05 | 1.31 | 1.66 | 0.34 | 0.80 | 2.07 | 2.59 |
| **Significance** | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns | ns |

Means in a column followed by same letters are not significantly different using DMRT at 5% level. ns = not significant, s = significant

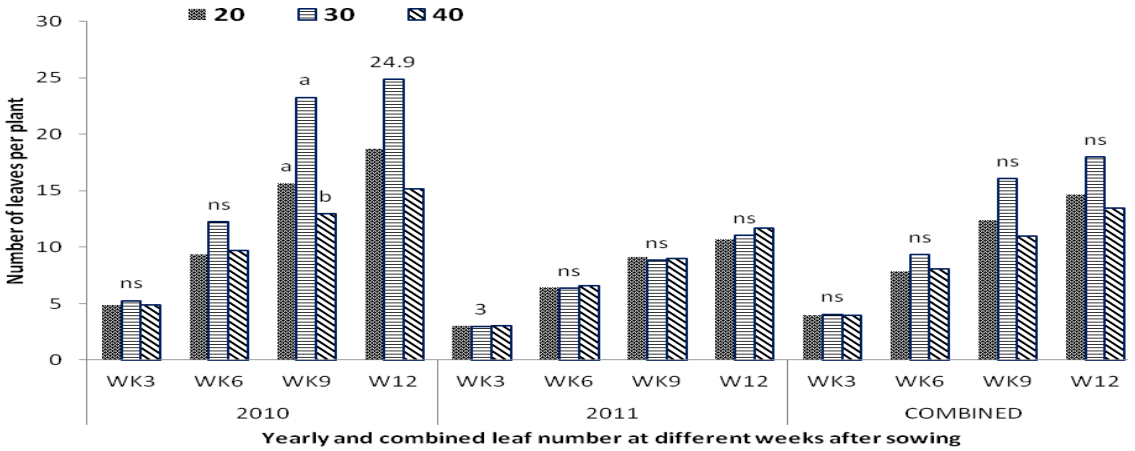


**Figure 3: Leaf number of Lablab as influenced by intra row spacing during 2010 and 2011 cropping seasons and the years combined**

**Table 4:** Monthly and total annual rainfall at the experimental site in 2010 and 2011 Cropping Seasons

| Month | Rainfall (mm) | |
|---|---|---|
| | **2010** | **2011** |
| April | 0.4 | 0 |
| May | 128.7 | 92.9 |
| June | 126.1 | 161.2 |
| July | 322.8 | 29.3 |
| August | 357.6 | 174.2 |
| September | 88.2 | 93.2 |
| October | 122.9 | 7 |
| **Total** | **1146.7** | **557.8** |

**Source:** Sultan Abubakar III International Airport

## CONCLUSION

It was concluded from this study that intra row spacing does not affect growth parameters of Lablab purpureus (L) under Sokoto environment and 30 cm intra row spacing is the best for dry matter yield in semi-arid Sokoto.

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